U.S. Department of Transportation

Federal Aviation Administration

Interface Requirements Document

Area Control Facility/Radio Control Equipment

ACF/RCE

NAS-IR-61004102
July 18, 1989

U.S. Department of Transportation

Federal Aviation Administration

Interface Requirements Document

Area Control Facility/Radio Control Equipment

ACF/RCE

INTERFACE REQUIREMENTS DOCUMENT

APPROVAL SIGNATURE PAGE

AREA CONTROL FACILITY/RADIO CONTROL EQUIPMENT

APPROVAL SIGNATURES		
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REVISION RECORD

REVISION LETTER	DESCRIPTION	DATE	ENTERED BY

EFFECTIVITY	
LOCATION	DATE *
ACF	Facility Equipment Layout Drawings
Albuquerque	ZAB-EL-ES-02
Anchorage	To be supplied
Atlanta	ZTL-EL-ES-02
Boston	ZBW-EL-ES-02
Chicago	ZAU-EL-ES-02
Cleveland	ZOB-EL-ES-02
Denver	ZDV-EL-ES-02
Fort Worth	ZFW-EL-ES-02
Honolulu	To be supplied
Houston	To be supplied
Indianapolis	ZID-EL-ES-02
Jacksonville	ZJX-EL-ES-02
Kansas City	ZKC-EL-ES-2
Los Angeles	ZLA-ES-ES-02
Memphis	ZME-EL-ES-02
Miami	ZMA-EL-ES-02
Minneapolis	ZMP-EL-ES-02
New York	ZNY-EL-ES-02
New York TRACON	To be supplied
Oakland	ZOA-EL-ES-02
Salt Lake City	ZLC-EL-ES-02
Seattle	ZSE-EL-ES-02
Washington, D.C.	ZDC-EL-ES-02

* The effectivity date will coincide with the subsystem site survey dates at the facility

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1. SCOPE

1.1 Scope. This Interface Requirements Document (IRD) provides the requirements for the physical, electrical, and environmental interface between the Area Control Facility (ACF) and the Radio Control Equipment (RCE). This document was prepared using the guidelines set forth in FAA-STD-025.

1.2 Subsystem/facility responsibility list.

Facility/ Subsystem	Common Name	Responsible Program Office
ACF	Area Control Facility	APS-120
RCE	Radio Control Equipment	APS-520

2. APPLICABLE DOCUMENTS

2.1 Government documents. In the event of conflict between the documents referenced herein and the contents of this IRD, this IRD shall be considered the superseding requirement.

STANDARDS:

FAA-STD-019a	09/26/85 -	Lightning Protection, Grounding, Bonding, and Shielding Requirements for Facilities
FAA-STD-020a	09/26/85 -	Transient Protection Grounding, Bonding, and Shielding Requirements for Equipment
FAA-STD-025b	10/29/87 -	Preparation of Interface Documentation
FAA-STD-032	04/29/86 -	Design Standard for National Airspace System Physical Facilities

Other Government Agency

MIL-STD-461C	08/04/86 -	Electromagnetic and Emission Susceptibility Requirements for the Control of Electromagnetic Interference

SPECIFICATIONS:

FAA-E-2738a	11/17/88 -	Radio Control Equipment
FAA-G-2100c	06/22/81 -	Electronic Equipment, General Requirements

DRAWINGS:

Site installation drawings to be developed during and after site surveys

OTHER PUBLICATIONS:

FAA Order 6950.2C	11/16/87 -	Electrical Power Policy Implementation at National Airspace System Facilities

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.

2.2 Non-Government documents. In the event of conflict between the documents referenced herein and the contents of this IRD, this IRD shall be considered the superseding requirement.

STANDARDS: Not Applicable

SPECIFICATIONS: Not Applicable

DRAWINGS: Not Applicable

OTHER PUBLICATIONS: Not Applicable

Technical society and technical association specifications and standards are generally available from reference libraries. They are also distributed among technical groups and using Federal agencies.

3. INTERFACE REQUIREMENT

3.1 General Requirements. The RCE shall be installed in the ACF and shall require essential power, critical power, heating, ventilation, and air conditioning (HVAC). Safety, security and environmental requirements are specified in FAA-STD-032. Those facility to subsystem interfaces required for equipment installations are identified herein.

3.2 Functional Requirements. The RCE subsystem interfaces to other subsystems are specified in FAA-E-2738, and do not form a part of this IRD. The RCE shall interface with the ACF and shall require accessibility and operational space, critical and essential power, and HVAC as specified herein.

3.3 Physical Requirements.

3.3.1 Electrical power/electronic requirements. The RCE equipment shall connect to the critical and essential power systems of the facility as specified in Figure 3-1.

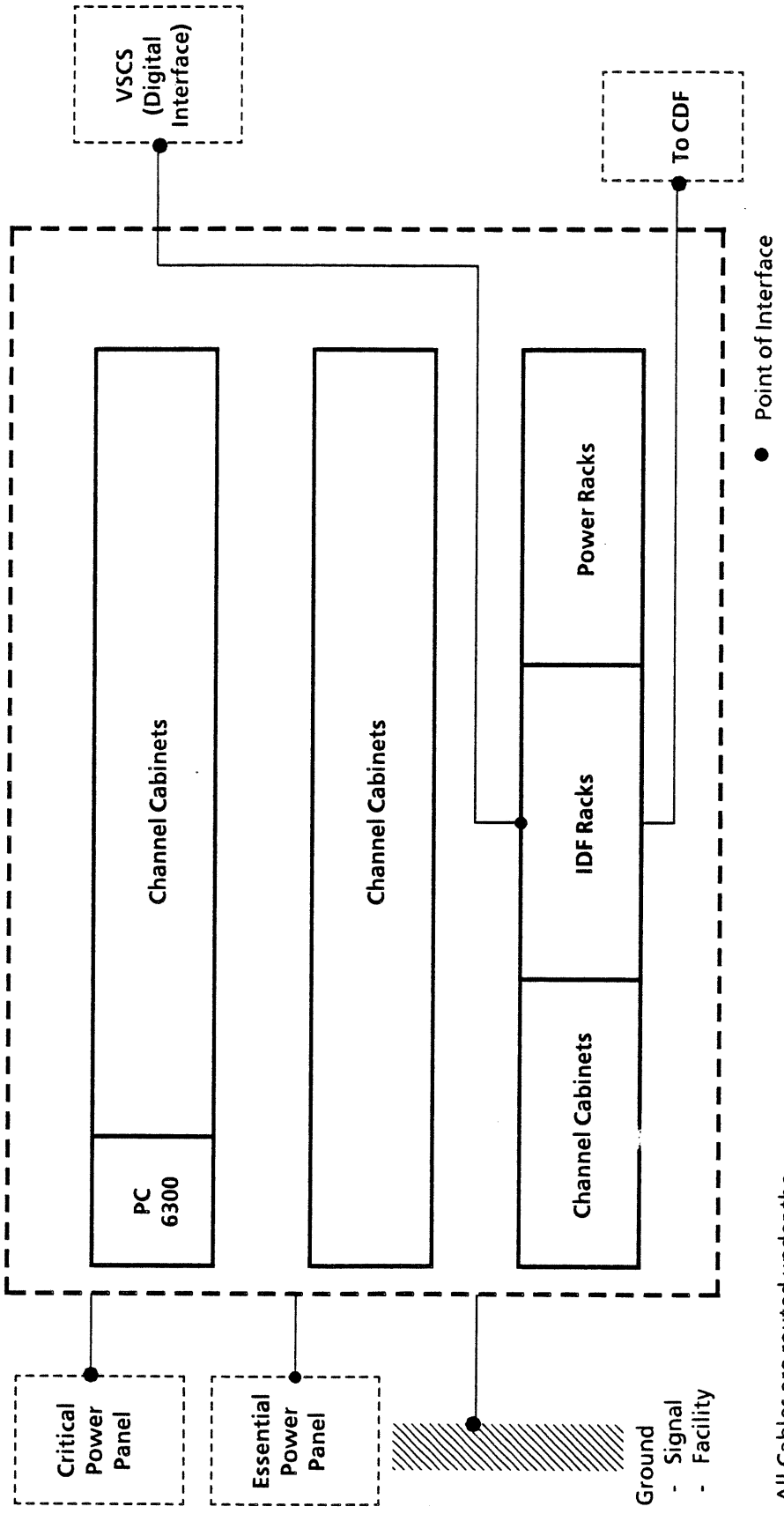
3.3.1.1 Connectors. The use of connectors which interface the RCE equipment with the facility power systems will be specified in the site facility installations drawings and shall be in accordance with FAA-STD-019, FAA-STD-020, and FAA-G-2100.

3.3.1.2 Wire/Cables. Interface wiring and cabling shall meet the requirements of, such as size and type, and shall be in accordance with FAA-STD-019 and FAA-STD-020. Interface wiring and cabling routing within the ACF will be specified in the site and installation drawings.

3.3.1.3 Shielding. Interface wiring and shielding requirements shall be such that isolation shall be maintained between the RCE and ACF power, ground and signal. This will provide proper operations of the RCE when installed in accordance with FAA-STD-019 and FAA-STD-020.

3.3.1.4 Electrical power/electronic referencing (grounding). The interface between RCE and facility grounding systems circuits for power and signal will be specified in site installation drawings to maintain FAA standardization in accordance with FAA-STD-019 and FAA-STD-020.

3.3.1.5 Electrical power transfer. The RCE maximum channels (210) connected to the ACF shall require 120 VAC 60 Hz with a 97.5 kVA at 82.88 kW consumption as referenced in Table 3-Ia. The electrical requirements for the RCE minimum channels (39) connected to the ACF are listed in Table 3-Ib. Power requirements such as ripple, transients, which is 10 msec nominal, and harmonious shall be in accordance with FAA Order 6950.2c, paragraph 8.c.(3) a through c and e through f and FAA-G-2100 paragraph 3.3.2.



Note:
a. All Cables are routed under the floor
b. Power and Ground Cable routing will not exceed 100 ft.
c. Total square ft. is based on standard ACFs

Figure 3- 1 Interface Diagram/RCE (CWB)

Table 3-Ia. RCE - Maximum Electrical Requirements

COMPONENT NAME	QTY	CRITICAL POWER					
		VOLTS 60Hz	Phase	UNIT kVA	TOTAL kVA	UNIT kW	TOTAL kW
RCE CHANNEL MODULE CABINET	45			0.00	0.00	0.00	0.00
RCE IDF	6			0.00	0.00	0.00	0.00
RCE POWER CABINET	7	120/240	1	13.93	97.50	11.84	82.88
		TOTAL CRITICAL kVA/kW:			97.50		82.88

COMPONENT NAME	QTY	ESSENTIAL POWER					
		VOLTS 60Hz	Phase	UNIT kVA	TOTAL kVA	UNIT kW	TOTAL kW
RCE CHANNEL MODULE CABINET	45	120	1	0.21	9.53	0.18	8.10
RCE IDF	6			0.00	0.00	0.00	0.00
RCE POWER CABINET	7			0.00	0.00	0.00	0.00
		TOTAL ESSENTIAL kVA/kW:			9.53		8.10

Table 3-Ib. RCE - Minimum Electrical Requirements

COMPONENT NAME	QTY	CRITICAL POWER					
		VOLTS 60Hz	Phase	UNIT kVA	TOTAL kVA	UNIT kW	TOTAL kW
RCE CHANNEL MODULE CABINET	11			0.00	0.00	0.00	0.00
RCE IDF	2			0.00	0.00	0.00	0.00
RCE POWER CABINET	3	120/240	1	5.20	15.60	4.42	13.26
		TOTAL CRITICAL kVA/kW:			15.60		13.26

COMPONENT NAME	QTY	ESSENTIAL POWER					
		VOLTS 60Hz	Phase	UNIT kVA	TOTAL kVA	UNIT kW	TOTAL kW
RCE CHANNEL MODULE CABINET	11	120	1	0.21	2.33	0.18	1.98
RCE IDF	2			0.00	0.00	0.00	0.00
RCE POWER CABINET	3			0.00	0.00	0.00	0.00
		TOTAL ESSENTIAL kVA/kW:			2.33		1.98

3.3.2 Mechanical requirements. The RCE equipment supplied shall be arranged in an efficient manner within the prescribed areas allotted in the facility. The equipment layout shall provide space for access to removable items from stationary mounted racks and/or consoles.

3.3.2.1 Location and orientation. The RCE equipment supplied shall be mounted in the facility as shown in Figure 3-2 on raised flooring and shall be mounted to withstand local seismic conditions. The ACF shall provide proper lighting requirements in accordance with FAA-STD-032, paragraph 3.6.3.3.

3.3.2.2 Holes. The holes required to mount RCE equipment racks and to provide wiring and cable access through the raised floor shall be provided for and implemented by the RCE project.

3.3.2.3 Fasteners. The type, quantities, etc., of fasteners required to mount the RCE subsystem components to the facility shall be provided by the RCE project and identified in the RCE site installation drawings.

3.3.2.4 Bonding. The bonding of the RCE interface to the ACF shall be provided by the facility in accordance with the FAA Facility requirements as specified in FAA-STD-019 and FAA-STD-020.

3.3.2.5 Surface finish. The surface finish for this interface shall be specified in the site installation drawings.

3.3.2.6 Markings. RCE and ACF interfaces shall be marked in accordance with FAA-STD-019, FAA-STD-020, and FAA-G-2100.

3.3.2.7 Materials. Material required for this interface shall be provided by the RCE and facility as specified in the site installation drawings.

3.3.2.8 Interchangeability. Not Applicable.

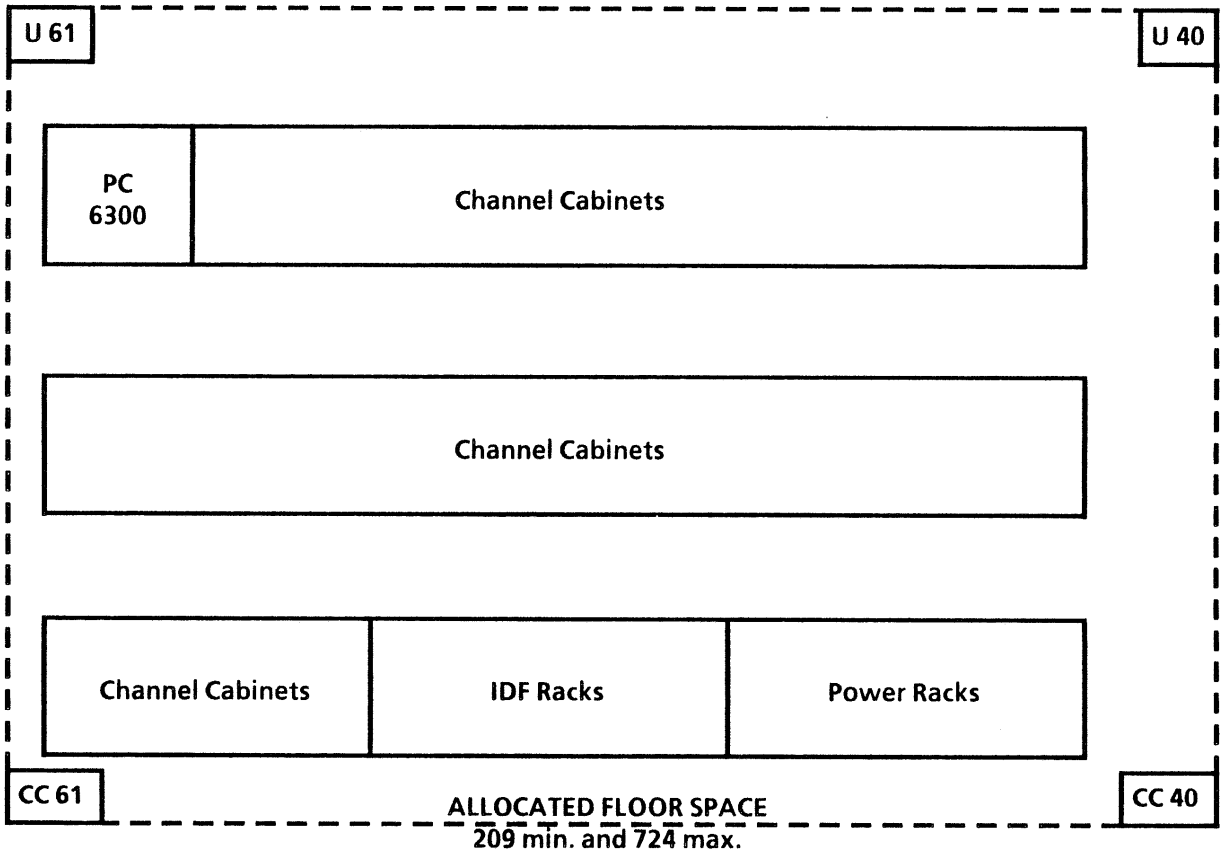
3.3.2.9 Weight and center of gravity. The RCE minimum and maximum standard layout equipment weights, sizes, and quantities shall be in accordance with Table 3-IIa and 3-IIb.

3.3.2.10 Fluids (gases and liquids). Not Applicable

3.3.3 Environmental requirements.

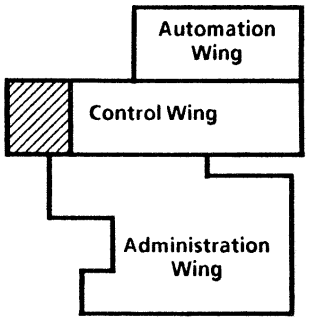
3.3.3.1 Envelope. The RCE equipment area dimensions shall not exceed those referenced in Figures 3-1 and 3-2. Additional space may be required for clearance around posts and air handling units. Posts and air handling units shall be as shown on the facility equipment layout drawings.

3.3.3.2 Electromagnetic and electrostatic discharge. All facility building equipment and subsystems shall meet the applicable requirements of MIL-STD-461, Part 7 (both emission and susceptibility) to ensure a high degree of electromagnetic compatibility (EMC) and minimize electromagnetic interference (EMI).



Note:

a. Location, space and orientation may vary based on ACF effectivity.
b. Dotted corner alphanumerics are wing floor location coordinates.
c. An additional 125 Square ft is required for work area at central maintenance workshop.
d. Rows are arranged so that racks in adjacent rows are back-to-back at front-to-front.
e. Additional floorspace shall be added as necessary for clearance around posts and air handling units. The air handling units will require__ square feet front clearance, some of which may be in the RCE area. Posts and air handling units shall be depicted on the facility equipment layout drawings.



Standard ACF
Key Plan

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Figure 3-2 Location/Orientation RCE/(CWB)

Table 3-IIa. RCE - Maximum Physical Requirements(1)

COMPONENT NAME	QTY	WIDTH (IN)	DEPTH (IN)	HEIGHT(4) (IN)	FRONT CLEAR(2) (IN)	REAR CLEAR(2) (IN)
RCE CHANNEL MODULE CABINET	45	21.75	22.00	83.00	24.00	15.00
RCE IDF	6	21.75	22.00	83.00	24.00	15.00
RCE POWER CABINET	7	24.50	22.00	83.00	24.00	15.00
PC 6300	1	24.50	22.00	48.00	24.00	15.00
OTHER SPACE(S)						

COMPONENT NAME	QTY	UNIT SPACE (sq.ft.)	TOTAL SPACE (sq.ft.)	UNIT WEIGHT (lbs)	TOTAL WEIGHT (lbs)
RCE CHANNEL MODULE CABINET	45	9.21	414.45	640.00	28800.00
RCE IDF	6	9.21	55.26	100.00	600.00
RCE POWER CABINET	7	10.38	72.65	600.00	4200.00
PC 6300	1	10.38	10.38	50.00	50.00
OTHER SPACE(s)			296.26		
	SUBSYSTEM TOTAL:		849.00		33600.00

NOTES:

(1) - DATA BASED ON THE LARGEST NUMBER OF CHANNELS (210) AFTER TRACON CONSOLIDATION AT AN ACF. EACH RCE MODULE CABINET CAN HOLD 6 CHANNELS AND EACH IDF CABINET CAN HOLD 48 CHANNELS THE QUANTITY OF MODULE CABINETS WAS COMPUTED BASED ON 5 CHANNELS PER CABINET (1 SPARE) AND 1 ADDITIONAL CABINET FOR EXPANSION.

(2) - ASSUMES ADJACENT ROWS WITH MIN OF 48" BETWEEN FRONTS AND 30" BETWEEN BACKS. HALF OF CLEARANCES ALLOCATED TO EACH RACK.

(3) - OTHER SPACE INCLUDES 3" CLEARANCE BETWEEN RACKS FOR RACK TOP ENTRY OF CABLES AND 125 SQ. FT. WORK SPACE.

(4) - RACK-TOP CABLE ENTRY WILL REQUIRE UP TO 12" TOP CLEARANCE

Table 3-IIb. RCE - Minimum Physical Requirements(1)

COMPONENT NAME	QTY	WIDTH (IN)	DEPTH (IN)	HEIGHT(4) (IN)	FRONT CLEAR(2) (IN)	REAR CLEAR(2) (IN)
RCE CHANNEL MODULE CABINET	11	21.75	22.00	83.00	24.00	15.00
RCE IDF	2	21.75	22.00	83.00	24.00	15.00
RCE POWER CABINET	3	24.50	22.00	83.00	24.00	15.00
PC 6300	1	24.50	22.00	48.00	24.00	15.00
OTHER SPACE(3)						

COMPONENT NAME	QTY	UNIT SPACE (sq.ft.)	TOTAL SPACE (sq.ft.)	UNIT WEIGHT (lbs)	TOTAL WEIGHT (lbs)
RCE CHANNEL MODULE CABINET	11	9.21	101.31	640.00	7040.00
RCE IDF	2	9.21	18.42	100.00	200.00
RCE POWER CABINET	3	10.38	31.14	600.00	1800.00
PC 6300	1	10.38	10.38	50.00	
OTHER SPACE(3)			172.75		
	SUBSYSTEM TOTAL:		334.00		9040.00

NOTES:

(1) - DATA BASED ON THE MINIMUM NUMBER OF CHANNELS (39) AFTER TRACON CONSOLIDATION AT AN ACF. EACH RCE MODULE CABINET CAN HOLD 6 CHANNELS AND EACH IDF CABINET CAN HOLD 48 CHANNELS. QUANTITY OF MODULE CABINETS WAS COMPUTED BASED ON 5 CHANNELS PER CABINET (1 SPARE) AND 1 ADDITIONAL CABINET FOR EXPANSION.

(2) - ASSUMES ADJACENT ROWS WITH MIN OF 48" BETWEEN FRONTS AND 30" BETWEEN BACKS. HALF OF CLEARANCES ALLOCATED TO EACH RACK.

(3) - OTHER SPACE INCLUDES 3" CLEARANCE BETWEEN RACKS FOR RACK TOP CABLE ENTRY AND 125 SQ. FT. WORK SPACE.

(4) - RACK-TOP CABLE ENTRY WILL REQUIRE UP TO 12" CLEARANCE.

3.3.3.3 Thermal. The maximum and minimum RCE subsystems shall be in accordance with the thermal parameters as shown in Table 3-IIIa and Table 3-IIIb.

3.3.3.3.1 Passive heat transfer. The maximum and minimum RCE subsystem heat transfer shall be in accordance with the values in Table 3-IIIa and Table 3-IIIb.

3.3.3.3.2 Cooling. The facility shall provide equipment cooling via chilled air. Facility air conditioning is designed to maintain room temperature at 75 degrees plus or minus 5 degrees (Fahrenheit) and a relative humidity of 50% plus 10% and minus 15%. Chilled air is provided under the raised floor. Floor mounted equipment, if air cooled, shall be designed for air flow from the bottom. The RCE subsystem requires no special cooling considerations beyond the above facility room temperature and humidity requirements.

3.3.3.4 Dynamic. The RCE subsystem dynamic load consideration shall be the normal facility design requirements for shock, vibration, damping, and acoustic considerations.

Table 3-IIIa. RCE - Maximum Environmental Requirements

TOTAL SUBSYSTEM BTU/H: 321300.00

COMPONENT NAME	QTY	AIR SUPPLY			
		ROOM TEMP		HUMID %	
		DEG F(L)	DEG F(H)	RH(L)	RH(H)
RCE CHANNEL MODULE CABINET	45	50	122	10	80
RCE IDF	6	-	-	-	-
RCE POWER CABINET	7	50	122	10	80

DEG F(L) = minimum degrees Fahrenheit
DEG F(H) = maximum degrees Fahrenheit
RH(L) = minimum relative humidity percentage
RH(H) = maximum relative humidity percentage

Table 3-IIIb. RCE - Minimum Environmental Requirements

TOTAL SUBSYSTEM BTU/H: 59,670.00

COMPONENT NAME	QTY	AIR SUPPLY			
		ROOM TEMP		HUMID %	
		DEG F(L)	DEG F(H)	RH(L)	RH(H)
RCE CHANNEL MODULE CABINET	11	50	122	10	80
RCE IDF	2	N/A	N/A	N/A	N/A
RCE POWER CABINET	3	50	122	10	80

DEG F(L) = minimum degrees Fahrenheit
DEG F(H) = maximum degrees Fahrenheit
RH(L) = minimum relative humidity percentage
RH(H) = maximum relative humidity percentage

4. QUALITY ASSURANCE PROVISIONS

4.1 General. Verification shall be in accordance with Table 4-I, Verification Requirements Traceability Matrix (VRTM). The verification levels and methods are presented below.

4.2 Special verification requirements. There are no special verification requirements for the RCE/ACF interfaces.

4.3 Verification levels and methods. The following subparagraphs list and define the levels and methods of verification appropriate for use in the VRTM presented herein:

4.3.1 Verification levels. There are three basic levels of verification. All requirements imposed by section 3 of the IRD shall be verified at one of the following three levels:

a. Subsystem level. This level of verification is usually accomplished at the contractor's facility and culminates in the formal acceptance of a contractual end-item.

b. Integration level. This level of verification is conducted at the key site. The verification will determine if the hardware/software to be deployed for site installation will perform in a NAS environment and in accordance with NAS System level operational and functional requirements.

c. Site level. This level of verification is usually performed at the designated site. The verification portion of the subsystem installation and checkout will emphasize the demonstration of the overall system performance requirements. It includes the demonstration of an end-item, subsystem and/or system, the final acceptance demonstrations, and commissioning activities. All verification levels for subsystem to facility interfaces would normally occur at installation site.

4.3.2 Verification methods. There are four verification methods that can be used at any of the three verification levels. Verification methods are:

a. Inspection. Inspection is a method of verification to determine compliance without the use of special laboratory appliances, procedures, or services, and consists of a non-destructive static-state examination of the hardware, software, and/or the technical data and documentation.

Table 4-I. Verification Requirements Traceability Matrix

D=Demonstration I=Inspection A=Analysis T=Test X=Not Applicable

Section 3 Requirements Paragraph Reference	Verification Phase and Method			
	Subsys Level	Integration Level	Site Level	Remarks
3. INTERFACE REQUIREMENTS				TITLE
3.1 General requirements	X	X	D	
3.2 Functional requirements	X	X	D	
3.3 Physical requirements				TITLE
3.3.1 Electrical power	A	X	D	
3.3.1.1 Connectors	X	X	I	
3.3.1.2 Wire/cable	X	X	I	
3.3.1.3 Shielding	X	X	I	
3.3.1.4 Electrical power/ electronic referencing	X	X	D	
3.3.1.5 Electrical power transfer	A-T	X	T	
3.3.2 Mechanical requirements	X	X	I	
3.3.2.1 Location and orientation	X	X	I	
3.3.2.2 Holes	I	X	X	
3.3.2.3 Fasteners	I	X	X	
3.3.2.4 Bonding	X	X	I	
3.3.2.5 Surface finish	I	X	X	
3.3.2.6 Markings	X	X	I	
3.3.2.7 Materials	I	X	X	
3.3.2.8 Interchangeability	X	X	X	
3.3.2.9 Weight and center of gravity	A-T	X	X	
3.3.2.10 Fluids (gases and liquids)	X	X	X	
3.3.3 Environmental requirements				TITLE
3.3.3.1 Envelope	I	X	X	
3.3.3.2 Electromagnetic and electrostatic discharge	A-T	X	X	
3.3.3.3 Thermal	A	X	X	
3.3.3.3.1 Passive heat transfer	A-T	X	X	
3.3.3.3.2 Cooling	A	X	T	
3.3.3.4 Dynamic	A-T	X	X	

b. Test. Test is a method of verification wherein performance is measured during or after the controlled application of functional and/or environmental stimuli. Quantitative measurements are analyzed to determine the degree of compliance. The process uses standardized laboratory equipment, procedures, hardware, and/or services.

c. Demonstration. Demonstration is a method of verification where qualitative determination of properties is made for a configuration item, including software, and/or technical data and documentation measured, in a dynamic state.

d. Analysis. This method of verification consists of comparing hardware or software design with known scientific and technical principles, procedures, and practices to estimate the capability of the proposed design to meet the mission and system requirements.

5. PREPARATION FOR DELIVERY. Not Applicable.

6. NOTES. The RCE subsystem cable routing within the facility will be determined during site surveys, prior to equipment installations, and do not form a part of this IRD. Table 6-I indicates ACF/RCE floor space requirements.

6.1 Operational concept. Not Applicable

6.2 Definitions. Not Applicable

6.3 Abbreviations and acronyms.

ACF	Area Control Facility
ATC	Air Traffic Control
BTU/H	British Thermal Unit/Hour
DEGF	Degrees Fahrenheit
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FAA	Federal Aviation Administration
FT	Foot
HVAC	Heating, Ventilation, and Air-conditioning
Hz	Hertz
IDF	Intermediate Distribution Frame
IN	Inches
IRD	Interface Requirements Document
kVA	Kilovoltampere
kW	Kilowatt
lbs	Pounds
NAS	National Airspace System
PSU	Power Supply Unit
QTY	Quantity
RCE	Radio Control Equipment
RH	Relative Humidity
sq.ft.	Square Feet
SQ	Square
TRACON	Terminal Radar Approach Control
VRTM	Verification Requirements Traceability Matrix

Table 6-I. ACF/RCE Floor Space Requirements

ACF	RCE Channels	Channel Cards	Racks IDF	Racks PSU	Space Required (Sq. Ft)*
Albuquerque	150	33	4	5	653
Chicago	196	42	5	7	801
Boston	165	36	5	6	714
Washington, D.C.	125	28	4	5	592
Denver	131	29	3	5	593
Fort Worth	181	39	5	6	751
Houston	210	45	6	7	849
Indianapolis	146	32	4	5	641
Salt Lake City	126	28	3	5	580
Jacksonville	203	43	5	7	822
Kansas City	153	33	4	6	666
Los Angeles	167	36	4	6	703
Miami	177	38	5	7	752
Memphis	120	27	4	5	580
Minneapolis	173	38	5	7	752
New York	84	19	3	5	470
Oakland	159	35	5	6	702
Cleveland	191	41	5	7	789
Seattle	134	30	4	5	616
Atlanta	193	41	5	6	776
Anchorage	143	32	4	5	641
Honolulu	39	11	2	3	334
New York TRACON	59	13	2	2	346

*Includes 15% growth factor, equipment clearances, and 125 sq. ft. of workspace.